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DAVID W. TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Md. 20084

FINITE ELEMENT ANALYSIS OF THE
ADP/COMMUNICATIONS SHELTER

by

Petro Matula and Erwin A. Schroeder

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COMPUTATION, MATHEMATICS, AND LOGISTICS DEPARTMENT
DEPARTMENTAL REPORT

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FINITE ELEMENT ANALYSIS OF THE ADP/COMMUNICATIONS SHELTER

DTNSRDC/CMLD-78/15

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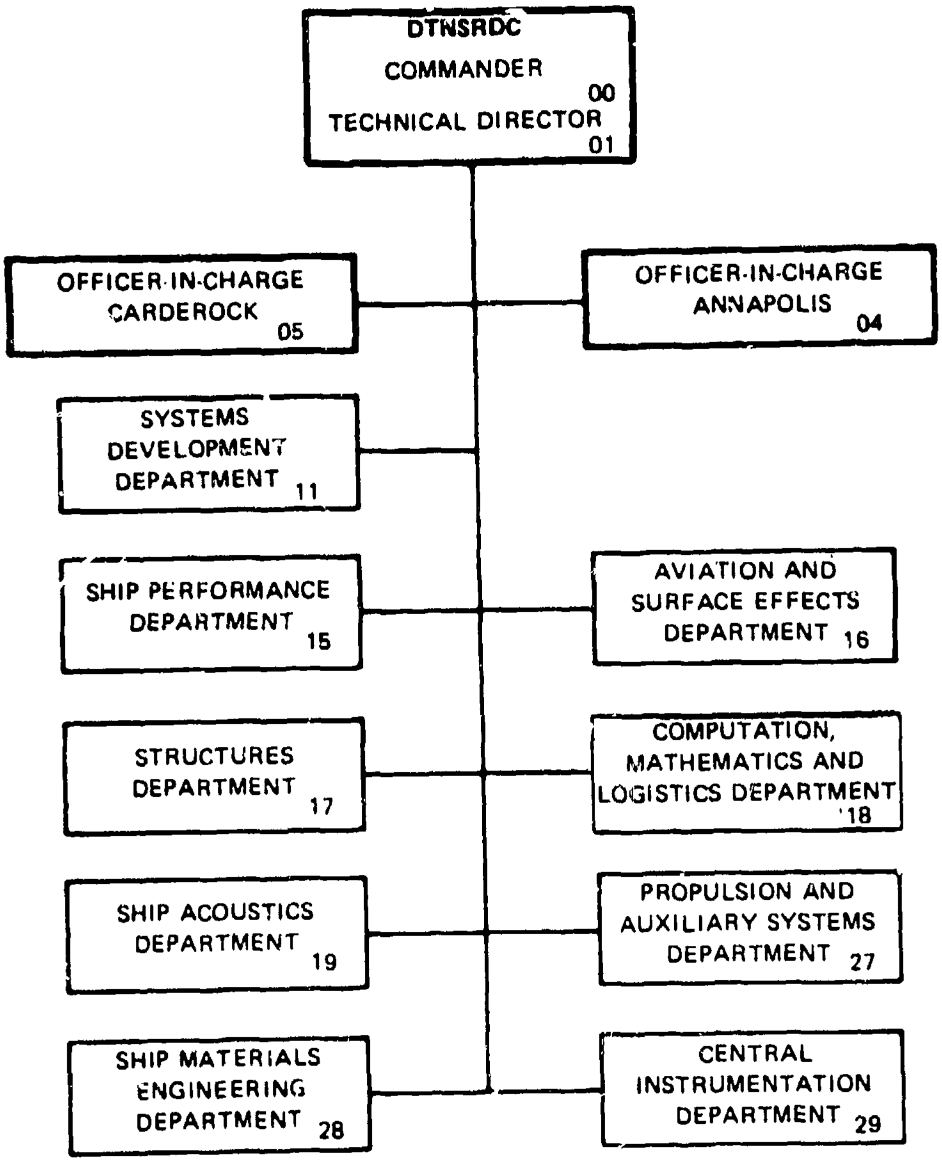

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The Navy NASTRAN Systems Office at the David W. Taylor Naval Ship Research and Development Center assisted the Naval Surface Weapons Center, Dahlgren Laboratory, in the structural analysis of the ADP/Communications portable computer shelter. The original and reinforced shelters were modeled with finite elements and the analysis was carried out using the computer program NASTRAN. The results of the analysis showed that the average stress in the floor of the shelter decreased 20% after the shelter had been reinforced.

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ABSTRACT

The Navy NASTRAN Systems Office at the David W. Taylor Naval Ship Research and Development Center assisted the Naval Surface Weapons Center, Dahlgren Laboratory, in the structural analysis of the ADP/Communications portable computer shelter. The original and reinforced shelters were modeled with finite elements and the analysis was carried out using the computer program NASTRAN. The results of the analysis showed that the average stress in the floor of the shelter decreased 20% after the shelter had been reinforced.

ADMINISTRATIVE INFORMATION

This work was funded by the MAGIS office of the Naval Surface Weapons Center.

INTRODUCTION

The Navy NASTRAN Systems Office, Code 1844, of the David W. Taylor Naval Ship R&D Center (DTNSRDC) was requested by the Naval Surface Weapons Center (NSWC) to assist in the analysis of the ADP communications portable computer shelter (ADP/Comm shelter). The purpose of this analysis was to evaluate the shelter's structural strength when it is subjected to various loads as specified under its transportability requirements.

First, the original shelter was analyzed. Then NSWC reinforced the original shelter on the basis of the analysis results, and this modified shelter was analyzed anew.

In this report the term "original" shelter refers to the shelter design received by DTNSRDC for analysis. The term "modified" or "reinforced" shelter refers to the shelter which resulted from modification of the original shelter. (The floor of the original shelter had already been modified when the shelter was first received by DTNSRDC.)

The analysis was performed by the finite element method using the computer program NASTRAN.

This report describes the work performed.

SHELTER DESCRIPTION

The shelter is an aluminum structure, approximately 8 feet wide by 20 feet long by 8 feet high (see Figure 1). It is made up of wall, roof, and floor panels. These six panels are joined along the edges to form the shelter enclosure. Figures 2, 3, and 4 show the connections between panels. The framework of these panels is made of tube beams with rectangular cross sections and with formed hat sections. The joists of the floor panel are braced with intercostals which also provide additional support to the floor. The floor panel is about four inches thick and is covered with aluminum skins 0.04 inches thick on the underside and 0.125 inches thick on the upper side. The roof and wall panels are about two inches thick and are covered with 0.04-inch thick aluminum skin. Approximately 1/4-inch thick wood spacers, as thermal insulation, are provided between the inner skin of the panel and its framework. The space between the skins in each panel is filled with a rigid foam insulation.

The shelter has a 3-ft. by 6-ft. main door located toward one end of one longitudinal wall and a 1.5-ft. by 6-ft. emergency door located in the other longitudinal wall diagonally opposite the main door.

The shelter has skid rails under the floor, wire rope sling attachments on the roof corners for helicopter lift and for tying down the shelter during rail transport, and pads and fittings at each end of the shelter for attachment of two-wheel trucks ("mobilizers") for road transportation.

The ADP equipment of the shelter is attached at strong points of the floor and the walls. Figure 5 shows an interior view of a partially equipped shelter.

STRUCTURAL AND EQUIPMENT MODIFICATIONS OF THE SHELTER

The general description of the shelter presented in the previous section applies to both the original and the modified shelters considered in this report. They differ only in details as described in this section.

As a result of the stress analysis of the original shelter NSWC strengthened the original shelter along corner joints and at the equipment attachment points. The modification of the corner joints can be seen in

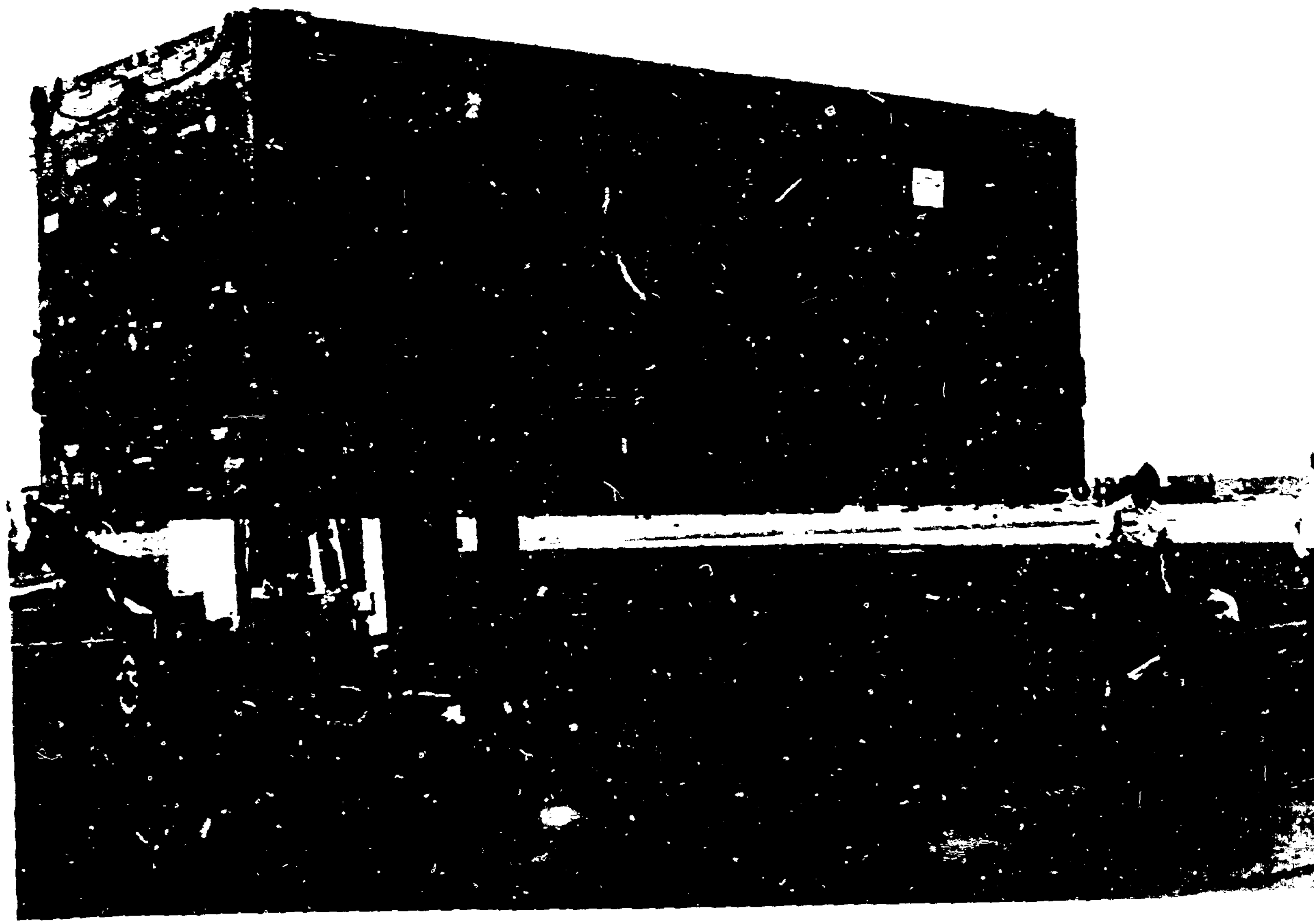

Figure 1 - ADP/Communications Shelter

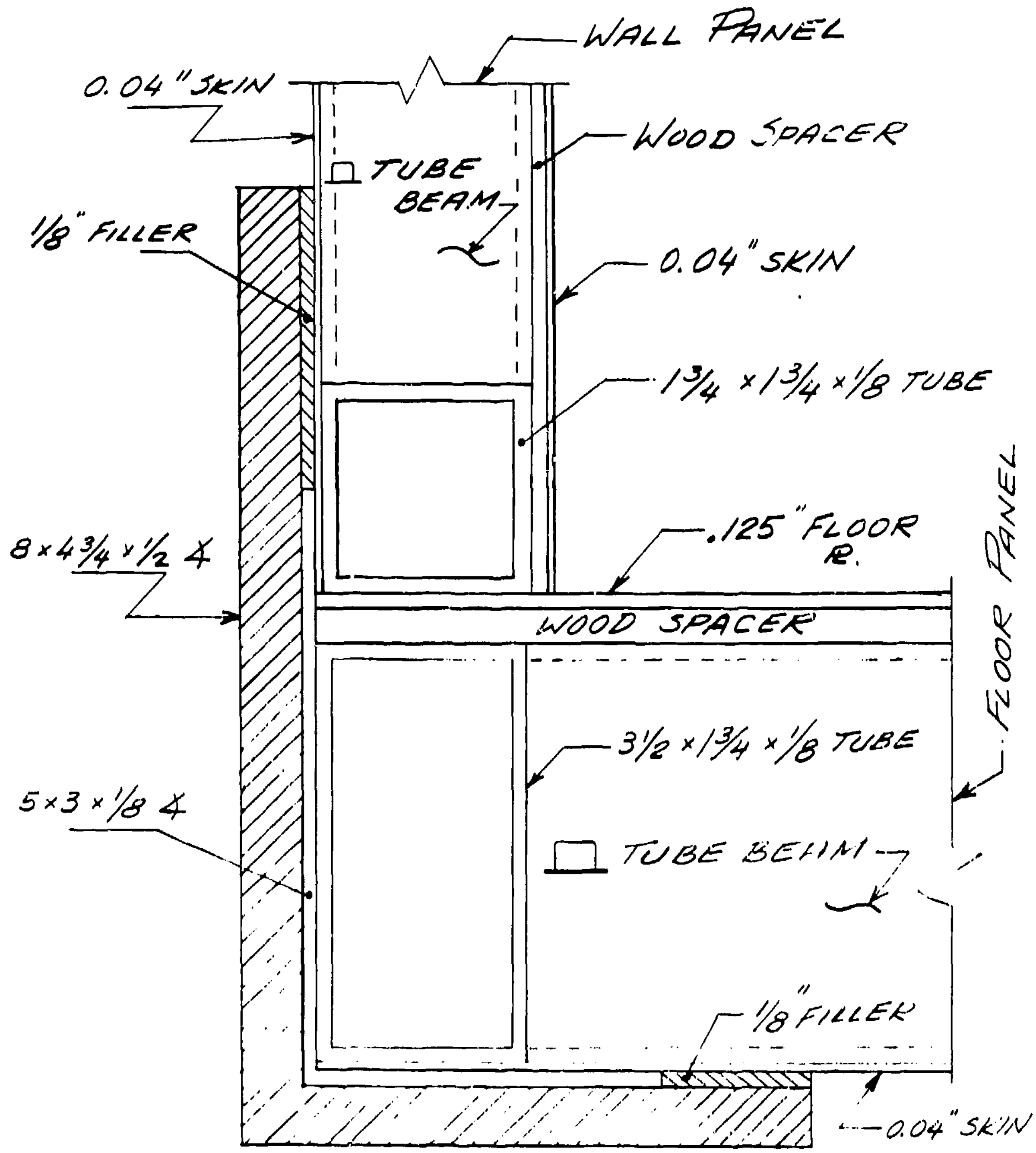

Figure 2 - Floor to Wall Joint, Reinforced (Shaded Parts are Reinforcements)

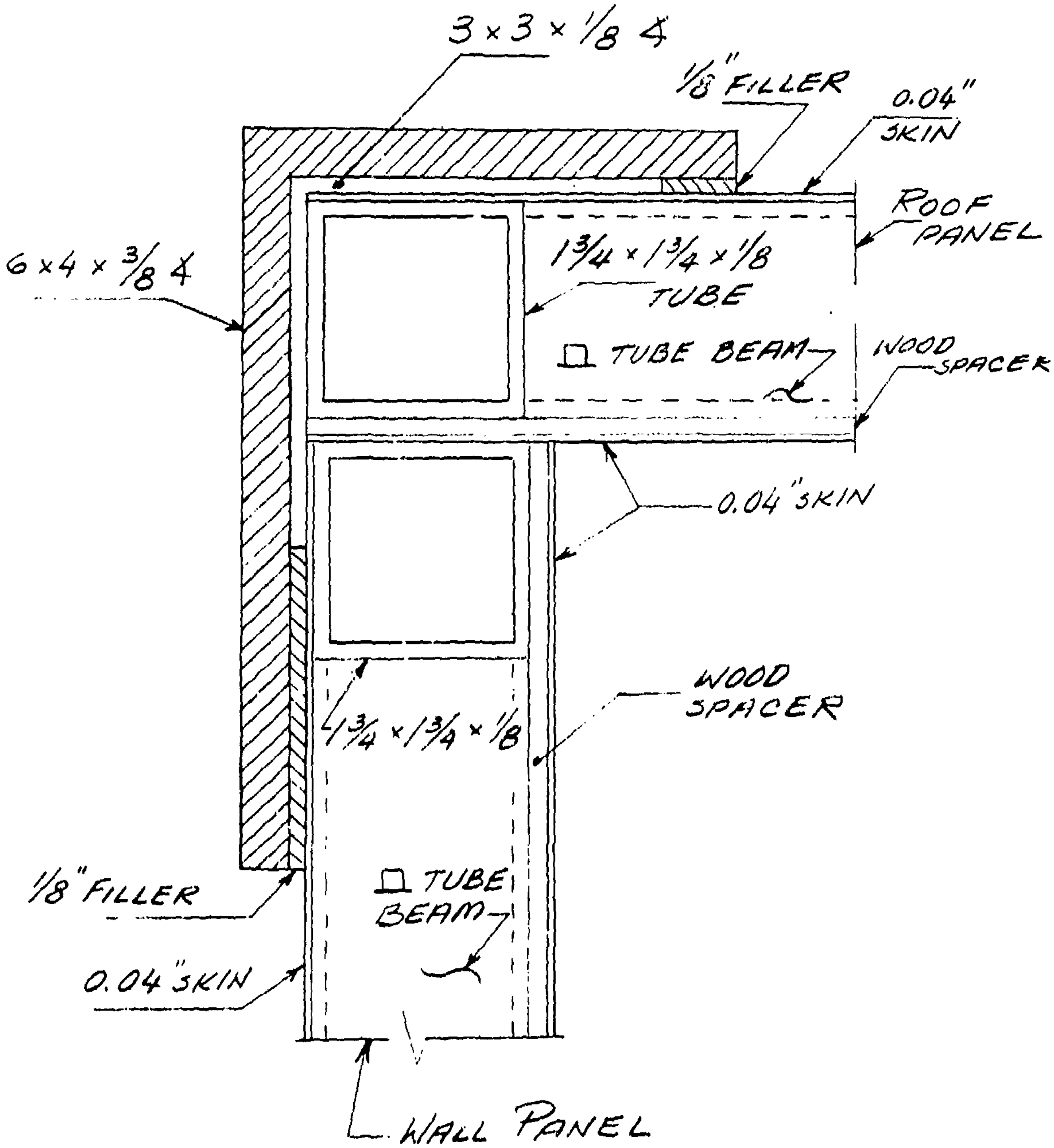

Figure 3 - Roof to Wall Joint, Reinforced (Typical, except Roof to A/C End Wall (see Fig. 6). Shaded Parts are Reinforcements.)

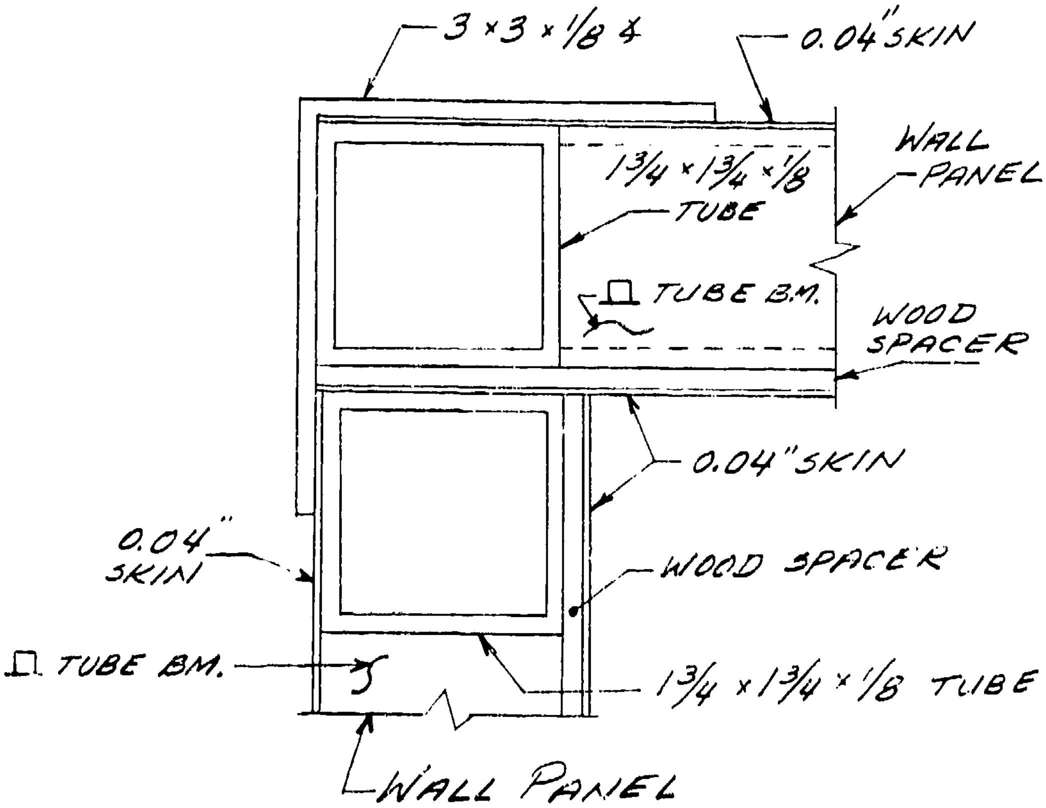

Figure 4 - Wall to Wall and Unreinforced Roof to Wall Joint

Figure 5 - Interior of ADP/Communications Shelter

Figures 2 and 3; the 8 x 4 3/4 x 1/2-inch and 6 x 4 x 3/8-inch angles and the associated 1/8-inch filler plates are the additions (shown shaded) to the original corner joint configuration.

The equipment mounting points were reinforced by adding beams running transversely to and connected to floor joist beams and wall stud beams under and behind the equipment.

In addition to structural modifications, some of the internal equipment was relocated and its anchorages modified.

These changes were accounted for in the finite element model of the modified shelter.

FINITE ELEMENT MODEL

The finite element model of the shelter was produced by modeling each wall, roof, and floor panel with NASTRAN plate and beam elements. The complete finite element shelter model as plotted by NASTRAN is shown in Figure 6. The plate elements and the grid points of the finite element model are located on the neutral plane between the inner and the outer skins of each panel.

The shelter was modeled in a rectangular coordinate system with the origin at the point of intersection of neutral planes of the main door wall panel, the air conditioning (A/C) end wall panel, and the floor panel.

The plate elements used were the NASTRAN quadrilateral QUAD1 and triangular TRIA1 elements. Because these elements allow separate specification of plate properties for bending, shear, and membrane actions, they can be used to model the skins. The effective thickness for shear and membrane action is equal to the sum of the thicknesses of the inner and outer skins. The bending stiffness is computed by treating the panel as a sandwich plate in which the two skins are separated by foam insulation.

It is assumed that the insulation between the skins prevents the skins from buckling but does not contribute directly to the strength of the panels.

NASTRAN's beam elements, BARs, run between the grid points. However, whenever a beam end does not coincide with a grid point, NASTRAN allows

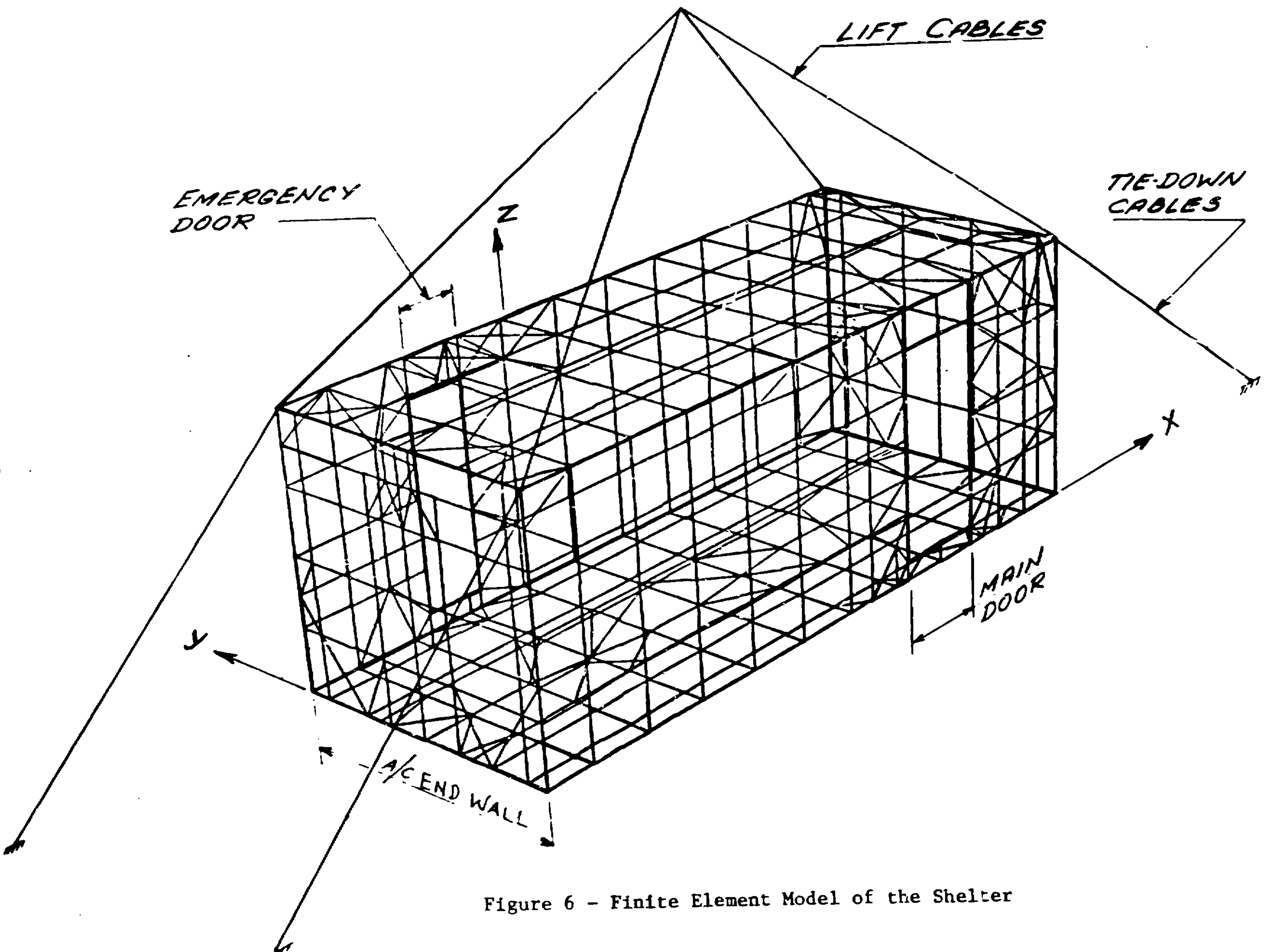

Figure 6 - Finite Element Model of the Shelter

specifying the offset for that beam end from its respective grid point.

Most of the beams of the shelter model are located at various offset distances from their respective grid points. Such offsets, however, do not show on plots done by NASTRAN plotting subroutines. Such plots show the BARs connecting grid points directly.

The tie down and helicopter lift wire rope cables are modeled with NASTRAN ROD elements. These elements possess axial and torsional stiffness only. For proper simulation of wire ropes the use of RODs in the shelter model is limited to axial tension.

The absence of bending stiffness in ROD elements made it possible to retain them in the finite element model even for those analyses which did not involve the cables. In such cases, the cables (RODs) were neutralized by a combination of proper boundary conditions and the absence of resistance in RODs in bending.

The ability to retain the same finite element model for various analysis conditions means that the stiffness matrix of the model did not have to be computed each time the cables were removed or added. This is important in reducing the cost of the analysis since the computation of the stiffness matrix is one of the more expensive computer operations.

The finite element model of the original shelter consists of:

382 grid points
2292 degrees of freedom (before constraints)
2210 degrees of freedom (after constraints)
218 rectangular plate elements, QUAD1
207 triangular plate elements, TRIA1
808 beam elements, BAR
8 rod elements, ROD

and the complete finite element model of the reinforced shelter consists of:

384 grid points
2304 degrees of freedom (before constraints)
2121 degrees of freedom (after constraints)
215 rectangular plate elements, QUAD1
211 triangular plate elements, TRIA1
877 beam elements, BAR
8 rod elements, ROD

LOADS AND BOUNDARY CONDITIONS

The shelter is required to withstand several kinds of dynamic loads. However, the normal mode analysis results indicated that these dynamic conditions could be simulated by static loads as follows (see also Normal Mode Analysis section):

1. The Simulated "Rail Hump" - combines 20-g vertical and 30-g horizontal loads. The horizontal load acts along the longitudinal dimension of the shelter. With the vertical load acting upward, the horizontal load was allowed to act first on one end of the shelter and then on the other end, to provide for the possibility that either end of the shelter might be forward during a rail hump. The same two horizontal loads were applied with the vertical load acting downward. Thus there were four distinct cases to be analyzed.

With the vertical load in the upward direction, the shelter was constrained at the upper four corners by tie-down cables (Figure 6). With the load acting down, the shelter rested on the skid rails.

To resist the horizontal load the "front" lower edge of the shelter rested against blocking and was prevented from overturning by the two "rear" tie-down cables.

2. The flat drop condition was simulated by a 20-g load acting downward with the shelter resting on the skids.

3. The helicopter lift was simulated by a 4-g load acting downward with the shelter suspended by sling cables attached to the four upper corners (Figure 6).

NORMAL MODE ANALYSIS

The shelter was analyzed for normal modes below 50 hertz. For this analysis the shelter was modeled as supported at the mobilizer attachment points to simulate the boundary conditions during ground transportation.

The results were compared by NSWC with shelter dynamic test data as well as with the specified time-dependent load functions to assure adequate separation of normal and input frequencies to avoid resonance.

The information thus derived helped to specify a static design load in place of a dynamic condition. The frequency of the fundamental mode of the original shelter was found to be 11.5 hertz. The vibration mode corresponding to this frequency is shown in Figure 7.

NASTRAN OUTPUT DESCRIPTION

Pages 18 through 33 contain samples of NASTRAN shelter analysis output, which consists of two parts: (1) complete listing of the input data, and (2) analysis results as requested. The parts are described in this section.

INPUT DATA

The input data listing is grouped as follows:

a. Executive Control Deck, page 18, defines the job and the type of analysis to be performed as well as many other conditions and requirements that a user may specify for his job.

b. Case Control Deck, page 19, defines a subcase structure for the problems, selects data from the Bulk Data Deck, and requests printed, punched, or plotted output. The Case Control Deck of the shelter problem contains six subcases. Each subcase specifies one of the prescribed load conditions for analysis as labeled. These labels and subcase numbers in the input data are used to identify the pages of analysis output.

c. Bulk Data Deck, beginning on page 20, is the primary NASTRAN input. This deck defines the structural model and various pools of data which may be selected by case control at execution time.

The shelter structure and the data for analyzing it are specified by the following alphabetically listed cards. For the specific format and requirements of the data cards, see the NASTRAN Users' Manual.[1]

CBAR — gives the grid point connections for the beam element, BAR, with axial, bending, torsional, and shear stiffness.

CONM2 — concentrated mass used to represent the mass of internal equipment.

[1] "The NASTRAN Users' Manual," NASA SP-222 (03), National Aeronautics and Space Administration, Washington, D.C. (1976).

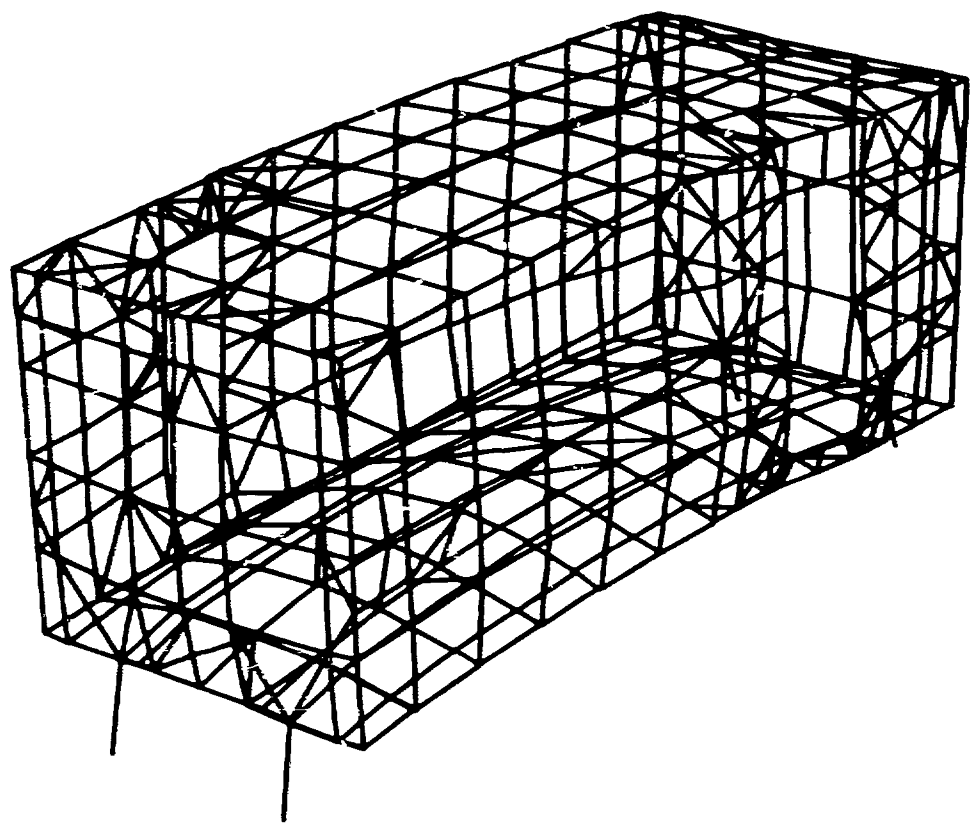

Figure 7 - Fundamental Vibration Mode of the Shelter

CQUAD1 connections for rectangular plate elements that represent the two skins on the panels.

CQUAD2 connections for rectangular plate elements used to represent panels.

CRIGD1 defines rigid connections between internal components of the shelter.

CRIGD2 rigid connections that represent mounting of the two doors by hinges and latches.

CROD connections for rod elements that are given only axial stiffness. Used to represent tie-down and lift cables.

CTRIA1 connections for triangular plate elements that represent the two skins.

DEFORM defines an initial deformation. Used to represent prestress in the tie-down cables.

EIGR specifies the range of natural frequencies to be computed.

GRAV specifies gravity type loads to represent the various types of loads on the shelter.

GRID defines the identification number of a grid point and specifies its coordinates.

LOAD defines combinations of the gravity loads given on the GRAV cards that represent the various loads applied to the shelter.

MAT1 specifies structural material properties.

MPC defines a linear equation between specified degrees of freedom.

PBAR defines beam properties for the BAR elements.

PQUAD1, PQUAD2, PTRIA1 define plate properties for the QUAD1, QUAD2, TRIA1 elements.

PROD defines properties for the ROD element.

SEQGP Input data was produced by BANDIT, a program that is a pre-processor to NASTRAN. BANDIT resequences the original numbering of grid points to minimize matrix solution time, page 25.

SPC1, SPCADD define boundary conditions.

ANALYSIS RESULTS

Samples of shelter analysis output data are shown on pages 27-33. Each page of the output is identified by the subcase label and the subcase number.

a. Displacement Vector, page 27, shows displacements of each grid point under the loading specified in the subcase shown at the top of the page. T1,T2, and T3 are translations, in inches, along the x-, y-, and z-axes, respectively. R1,R2, and R3 are rotations, in radians, about the x-, y-, and z-axes, respectively.

b. Load Vector, page 28, shows the loads at each grid point resulting from the applied gravity action. T1,T2, and T3 are loads acting along the x-, y-, and z-axes, respectively. R1,R2, and R3 are moments acting about the x-, y-, and z-axes, respectively.

c. Forces of Single-Point Constraint, page 29, show force reactions of the constrained grid points. T1,T2, and T3 are force reactions acting along the x-, y-, and z-axes, respectively. R1,R2, and R3 are moment reactions acting about the x-, y-, and z-axes, respectively.

d. Stresses in Bar Elements (BAR), page 32. NASTRAN provides for obtaining stresses at up to four points on the end cross-section of a bar element. The first column in this output gives element ID number. The next four columns show the stresses at the eight specified points for each bar element arranged as follows:

SA1 - Stress @ end A, point #1.
SB1 - Stress @ end B, point #1.
→ 0.0
→ 0.0

etc.

The sixth column shows the axial stress. The last two columns give maximum and minimum stresses at ends A and B. These stresses are obtained by adding the axial stress (col. 6) and the maximum positive bending stress at one of eight specified points to produce "MAX.", and the axial stress plus the highest negative bending stress for "MIN.".

e. Stresses in General Quadrilateral Elements (QUAD1), page 33. Columns 3, 4, and 5 show stresses in plate elements in the element

coordinate system. The plate element coordinate system in NASTRAN is established on CQUAD and CTRIA cards as follows: the origin is at the first grid point listed on the card. The x-axis goes through the second listed point. The y- and z-axes are then added according to the right-hand rule. Columns 6, 7, 8, and 9 show principal stresses as computed from the stresses in columns 3, 4, and 5. QUAD1 element ID numbers are listed in Column 1. Column 2 shows the distance from the neutral plane to the fibers at which the stress was requested. The fiber distance is in the element coordinate system.

RESULTS OF THE ANALYSIS

After the original shelter was modeled and analyzed, it was reinforced and the internal equipment and its supports were rearranged. The analysis process was then repeated on the modified shelter.

The reinforcements consisted mainly of additional floor and wall beams for equipment mounting and strengthened joints between the floor and the walls.

The finite element model was changed to reflect these modifications in the shelter and equipment configuration. These reinforcements changed the original finite element model by the shelter sufficiently to preclude accurate point-by-point comparison of stresses between the two shelters. However, for an analysis of a rail hump--the most severe of the tests--the average of the stresses in the internal floor beams was computed and found to decrease by 20% after reinforcements to the shelter were incorporated in the finite element model.

ACKNOWLEDGMENTS

We acknowledge the help of Suzanne Wybraniec who took an active interest in preparing and checking the NASTRAN input data and tabulating the stress output. Michael Golden wrote a computer program that expedited punching the large number of data cards needed to model the shelter. We also thank Dr. S. K. Dhir for his interest and helpful suggestions.

APPENDIX

NASTRAN SAMPLE* DATA AND OUTPUT

*NOTE: The complete NASTRAN output set is available from Dr. C. Blackmon, Code K21, NSWC, Dahlgren, Virginia 22448.

N A S T R A N   E X E C U T I V E   C O N T R O L   D E C K   E C H O

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ID COMPUTER SHELTER, CASH 1844
DIAG 1,6,19,22
TIME 190
$SEQUENCE YES
$GRID 400
$CONFIG 6
$PRINT MAX
CHKPNT YES,DISK
APP DISPL
SOL 1,0
ALTER 63
PARAM //C,N,SYST/C,N,/C,N,58/C,N,2 $
ALTER 84
PARAM //C,N,SYST/C,N,/C,N,58/C,N,0 $
ENDALTER
CEND
```

C A S E   C O N T R O L   D E C K   E C H O

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  2      MPC=1
  3      STRESS=ALL
  4      DISP=ALL
  5      OLOAD=ALL
  6      SPCFORCES=ALL
  7      ELFORCE=ALL
  8      SUBCASE 1
  9           LABEL=RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD
 10           SPC=11215
 11           LOAD=25
 12      SUBCASE 2
 13           LABEL=RAIL HUMP-OTHER END FORWARD-VERTICAL ACCELERATION UPWARD
 14           SPC=11315
 15           LOAD=12
 16      SUBCASE 3
 17           LABEL=RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION DOWNWARD
 18           SPC=11112
 19           LOAD=45
 20      SUBCASE 4
 21           LABEL=RAIL HUMP-OTHER END FORWARD-VERTICAL ACCELERATION DOWNWARD
 22           SPC=11113
 23           LOAD=14
 24      SUBCASE 5
 25           LABEL=   HELIO LIFT - 4 G
 26           SPC=116
 27           LOAD=3
 28      SUBCASE 6
 29           LABEL=    DROP TEST - 20 G
 30           SPC=110
 31           LOAD=4
 32      BEGIN BULK
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*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED,XSORT WILL RE-ORDER DECK.

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1752-	+ 2078			-.70000	0.00000	0.00000	-.70000	0.00000	0.00000	
1753-	CONM2	1	1		.90495					
1754-	CONM2	2	2		.46540					
1755-	CONM2	3	3		.80153					
1756-	CONM2	4	4		.77567					
1757-	CONM2	6	6		.35681					
1758-	CONM2	7	7		2.01417					
1759-	CONM2	8	8		2.94756					
1760-	CONM2	9	9		.25856					
1761-	CONM2	13	13		2.50902					
1762-	CONM2	14	14		.08791					
1763-	CONM2	15	15		.80929					
1764-	CONM2	16	16		.38784					
1765-	CONM2	17	17		[illegible]					
1766-	CONM2	18	18		[illegible]					
1767-	CONM2	19	19		3.23198					
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1769-	CONM2	21	21		.33613					
1770-	CONM2	22	22		.01034					
1771-	CONM2	23	23		.06076					
1772-	CONM2	24	24		.01681					
1773-	CONM2	25	25		.42662					
1774-	CONM2	26	26		.68001					
1775-	CONM2	27	27		.08765					
1776-	CONM2	28	28		1.16351					
1777-	CONM2	29	29		.10342					
1778-	CONM2	30	30		.09825					
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1780-	CONM2	36	19301		.05639					
1781-	CONM2	37	1179301		.05639					
1782-	CONM2	38	1170101		.05639					
1783-	CONM2	39	10187		.06381					
1784-	CONM2	40	19387		.06381					
1785-	CONM2	41	1179387		.06381					
1786-	CONM2	42	1170187		.06381					
1787-	CONM2	43	309343		.15772					
1788-	CQUAD1	411	406	10101	10121	10821	10801			
1789-	CQUAD1	453	406	10143	10164	10864	10843			
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1794-	CQUAD1	2070	406	10864	10877	13377	13364			
1795-	CQUAD1	4011	406	13301	13321	14721	14701			
1796-	CQUAD1	4032	406	13321	13343	14743	14721			
1797-	CQUAD1	4053	406	13343	13364	14764	14743			
1798-	CQUAD1	4482	406	14277	14287	14787	14777			
1799-	CQUAD1	4982	406	14777	14787	15287	15277			
1800-	CQUAD1	5311	406	14701	14721	16021	16001			

SORTED BULK DATA ECHO

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2002-        COQUAD2 212     37      99321   99331   19331   19321
2003-        COQUAD2 213     37      1179321 1179331 1089331 1089321
2004-        CRIGD1  262     4       7
2005-        CRIGD1  263     15      18
2006-        CRIGD1  264     1       4
2007-        CRIGD2  48      25      780122  12345   780146  12345   780160  12345   +CRD11
2008-        +CRD11    940121      2 940143        2 940164        2
2009-        CRIGD2  49      309343  239321  12345   239343  12345   239364  12345   +CRD21
2010-        +CRD21    349322      2 349343        2 349364        2
2011-        CROD    31      50      31      10187
2012-        CROD    32      50      32      19387
2013-        CROD    33      50      33      1170187
2014-        CROD    34      50      34      1179387
2015-        CROD    51      50      51      10187
2016-        CROD    52      50      52      19387
2017-        CROD    57      50      57      1170187
2018-        CROD    58      50      58      1179387
2019-        CTRIA1  324     407     10121   10131   10821
2020-        CTRIA1  339     407     10131   10143   10843
2021-        CTRIA1  531     407     10131   10843   10821
2022-        CTRIA1  3672    407     13364   13377   14277
2023-        CTRIA1  4068    407     13364   14277   14764
2024-        CTRIA1  4572    407     14277   14764   14777
2025-        CTRIA1  4872    407     14764   14777   15277
2026-        CTRIA1  5368    407     14764   15277   16064
2027-        CTRIA1  5772    407     15277   16077   16064
2028-        CTRIA1  8931    407     18621   18643   19331
2029-        CTRIA1  9124    407     18621   19331   19321
2030-        CTRIA1  9139    407     18643   19343   19331
2031-        CTRIA1  11208   407     12101   10821   10801
2032-        CTRIA1  12014   407     12101   10821   12321
2033-        CTRIA1  12908   407     12101   13321   13301
2034-        CTRIA1  16508   407     16001   16021   17001
2035-        CTRIA1  17114   407     17001   16021   18621
2036-        CTRIA1  18008   407     17001   18621   18601
2037-        CTRIA1  30068   407     10164   90164   10177
2038-        CTRIA1  30083   407     10177   90187   10187
2039-        CTRIA1  30387   611     10187   90187   10887
2040-        CTRIA1  31887   611     10887   92487   12487
2041-        CTRIA1  33000   112     12901   13301   92901
2042-        CTRIA1  33087   611     12487   92487   14287
2043-        CTRIA1  34200   112     13301   14701   94701
2044-        CTRIA1  34587   611     14287   94787   14787
2045-        CTRIA1  34887   611     14787   94787   15287
2046-        CTRIA1  35100   112     14701   16001   94701
2047-        CTRIA1  36300   112     16001   16501   96501
2048-        CTRIA1  36487   611     15287   97087   17087
2049-        CTRIA1  37587   611     17087   97087   18687
2050-        CTRIA1  39187   611     18687   99387   19387
```

SORTED BULK DATA ECHO

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
2201-	CTRIA1	1159379	407	1139387	1179364	1179387				
2202-	CTRIA1	1170224	407	1170121	1170131	1170821				
2203-	CTRIA1	1170239	407	1170131	1170143	1170843				
2204-	CTRIA1	1170431	407	1170131	1170843	1170821				
2205-	CTRIA1	1171109	407	1170801	1170821	1172101				
2206-	CTRIA1	1171528	407	1170821	1170843	1173321				
2207-	CTRIA1	1171553	407	1170843	1170864	1173352				
2208-	CTRIA1	1171576	407	1170864	1170887	1173379				
2209-	CTRIA1	1172115	407	1170821	1173321	1172101				
2210-	CTRIA1	1172438	407	1170843	1173352	1173321				
2211-	CTRIA1	1172465	407	1170864	1173379	1173352				
2212-	CTRIA1	1172484	407	1170887	1173387	1173379				
2213-	CTRIA1	1172908	407	1172101	1173301	1173321				
2214-	CTRIA1	1175421	407	1176121	1174721	1176143				
2215-	CTRIA1	1175443	407	1176143	1174721	1174752				
2216-	CTRIA1	1175448	407	1176143	1174752	1176152				
2217-	CTRIA1	1176407	407	1176101	1176121	1177001				
2218-	CTRIA1	1177038	407	1176121	1176143	1178643				
2219-	CTRIA1	1177048	407	78643	1176143	1176152				
2220-	CTRIA1	1177065	407	76152	1176179	1178664				
2221-	CTRIA1	1177084	407	1176179	1176187	1178687				
2222-	CTRIA1	1177314	407	1176121	1178621	1177001				
2223-	CTRIA1	1177928	407	1176121	1178621	1178643				
2224-	CTRIA1	1177953	407	1176152	1178664	1178643				
2225-	CTRIA1	1177976	407	1176179	1178664	1178687				
2226-	CTRIA1	1178408	407	1177001	1178601	1178621				
2227-	CTRIA1	1178931	407	1178621	1178643	1179331				
2228-	CTRIA1	1179124	407	1178621	1179321	1179331				
2229-	CTRIA1	1179139	407	1178643	1179343	1179331				
2230-	DEFORM	1	51	-.042	52	-.042				
2231-	DEFORM	1	57	-.042	58	-.042				
2232-	EIGR	15	INV	0.0	15.	3	3		1.E-3	+EIGR15
2233-	+EIGR15	MAX								
2234-	GRAV	1		386.76	30.	0.0	0.0			RAIL
2235-	GRAV	2		386.76	0.0	0.0	20.			HUMP
2236-	GRAV	3		386.76	0.0	0.0	-4.			4G
2237-	GRAV	4		386.76	0.0	0.0	-20.			20G
2238-	GRAV	5		386.76	-30.	0.0	0.0			-30 >
2239-	GRID	1		219.10	71.85	43.64				
2240-	GRID	2		213.00	91.50	28.47				
2241-	GRID	3		189.50	91.50	22.47				
2242-	GRID	4		194.00	73.00	20.97				
2243-	GRID	6		164.50	77.50	70.97				
2244-	GRID	7		144.60	71.57	36.93				
2245-	GRID	8		105.75	79.22	28.33				
2246-	GRID	9		76.50	80.75	39.97				
2247-	GRID	13		22.85	75.00	38.34				
2248-	GRID	14		3.00	46.50	66.97				
2249-	GRID	15		24.90	23.00	26.07				
2250-	GRID	16		35.00	5.00	67.97				

S O R T E D   B U L K   D A T A   E C H O

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CARD
COUNT        .   1  ..   2  ..   3  ..   4  ..   5  ..   6  ..   7  ..   8  ..   9  ..  10  .
2601-        GRID    1174701         232.940 46.3750 .0000
2602-        GRID    1174721         232.940 46.3750 20.4700
2603-        GRID    1174752         232.940 46.3750 51.3500
2604-        GRID    1176101         232.940 60.2500 .0000
2605-        GRID    1176121         232.940 60.2500 20.4700
2606-        GRID    1176143         232.940 60.2500 42.8500
2607-        GRID    1176152         232.940 60.2500 51.3500
2608-        GRID    1176179         232.940 60.2500 78.3500
2609-        GRID    1176187         232.940 60.2500 86.7200
2610-        GRID    1176501         232.940 64.5300 .0000
2611-        GRID    1177001         232.94  69.78   .0
2612-        GRID    1178601         232.940 85.7500 .0000
2613-        GRID    1178621         232.940 85.7500 20.4700
2614-        GRID    1178643         232.940 85.7500 42.8500
2615-        GRID    1178664         232.940 85.7500 63.8500
2616-        GRID    1178687         232.940 85.7500 86.7200
2617-        GRID    1179301         232.940 92.9400 .0000
2618-        GRID    1179321         232.940 92.9400 20.4700
2619-        GRID    1179331         232.940 92.9400 30.7200
2620-        GRID    1179343         232.940 92.9400 42.8500
2621-        GRID    1179364         232.940 92.9400 63.8500
2622-        GRID    1179387         232.940 92.9400 86.7200
2623-        LOAD    12      1.      1.      1       1.      2
2624-        LOAD    14      1.      1.      1       1.      4
2625-        LOAD    25      1.      1.      2       1.      5
2626-        LOAD    45      1.      1.      4       1.      5
2627-        MAT1    1       10.2+6  3.83+6          2.508-4
2628-        MAT1    30      10.2+6  3.8+6
2629-        MAT1    50      3.+7            .3
2630-        MAT1    112     10.2+6  3.83+6          2.164-4
2631-        MPC     1       12101   1       .4281   12901   1       -1.                     +MC01
2632-        +MC01              13301       1   .5719
2633-        MPC     1       12101   2       .4281   12901   2       -1.                     +MC09
2634-        +MC09              13301       2   .5719
2635-        MPC     1       12101   3       .4281   12901   3       -1.                     +MC02
2636-        +MC02              13301       3   .5719
2637-        MPC     1       17001   1       .4281   16501   1       -1.                     +MC03
2638-        +MC03              16001       1   .5719
2639-        MPC     1       17001   2       .4281   16501   2       -1.                     +MC11
2640-        +MC11              16001       2   .5719
2641-        MPC     1       17001   3       .4281   16501   3       -1.                     +MC04
2642-        +MC04              16001       3   .5719
2643-        MPC     1       1172101 1       .4281   1172801 1       -1.                     +MC05
2644-        +MC05            1173301       1   .5719
2645-        MPC     1       1172101 2       .4281   1172801 2       -1.                     +MC13
2646-        +MC13            1173301       2   .5719
2647-        MPC     1       1172101 3       .4281   1172801 3       -1.                     +MC06
2648-        +MC06            1173301       3   .5719
2649-        MPC     1       1177001 1       .4281   1176501 1       -1.                     +MC07
2650-        +MC07            1176101       1   .5719
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S O R T E D   B U L K   D A T A   E C H O

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CARD
COUNT        .   1  ..   2  ..   3  ..   4  ..   5  ..   6  ..   7  ..   8  ..   9  ..  10  .
2751-        +   6005                                                                 +   6006
2752-        +   6006 .34434  .1284
2753-        PBAR    404     1       .8125   .3597   .3597   .00403                   +   6007
2754-        +   6007                                                                 +   6008
2755-        +   6008 .27     .27
2756-        PBAR    405     1       .92187  .3866   .45696  .00515                   +   6009
2757-        +   6009                                                                 +   6010
2758-        +   6010 .36477  .25013
2759-        PBAR    408     1       1.32    1.16426 .6163   .00629                   +   6011
2760-        +   6011                                                                 +   6012
2761-        +   6012 .50525  .37519
2762-        PBAR    410     1       .6      .95     .1      .0                       +   SW21
2763-        +   SW21                                                                 +   SW22
2764-        +   SW220.0     1.0
2765-        PBAR    411     1       .8288   .50453  .39228  .01259                   +   SW64
2766-        +   SW641.875   -.962   .875    .663    -.875   .663    -1.875  -.962    +   SW65
2767-        +   SW65.42438  .1284
2768-        PBAR    421     1       .8288   .50453  .39228  .01259  .0028            +   SW60
2769-        +   SW60                                                                 +   SW61
2770-        +   SW61.42438  .1284
2771-        PBAR    502     1       2.08125 5.00418 1.07401 .02014                   +   6043
2772-        +   6043                                                                 +   6044
2773-        +   6044 1.00967 .37852
2774-        PBAR    503     1       1.245   1.42138 .66255  .00572                   +   6045
2775-        +   6045                                                                 +   6046
2776-        +   6046 .5336   .29181
2777-        PBAR    504     1       .92187  .3866   .45696  .00515                   +   6047
2778-        +   6047                                                                 +   6048
2779-        +   6048 .36477  .25013
2780-        PBAR    511     1       2.355   4.928   .283    .04                      +   SW41
2781-        +   SW41                                                                 +   SW42
2782-        +   SW420.3     0.7
2783-        PBAR    512     1       1.980   2.326   .256    .04                      +   SW43
2784-        +   SW43                                                                 +   SW44
2785-        +   SW440.3     0.7
2786-        PBAR    601     1       2.4250  3.4660  1.5189  .02139                   +   6049
2787-        +   6049                                                                 +   6050
2788-        +   6050    .9688   .6286
2789-        PBAR    602     1       1.7069  1.0836  1.2393  .01738                   +   6051
2790-        +   6051                                                                 +   6052
2791-        +   6052    .6382   .5002
2792-        PBAR    603     1       1.81945 7.59992 7.64746 .0015                    +   6053
2793-        +   6053                                                                 +   6054
2794-        +   6054 .53483  .67874
2795-        PBAR    604     1       .79645  .19735  3.48038 .00225                   +   6055
2796-        +   6055                                                                 +   6056
2797-        +   6056 .18609  .34514
2798-        PQUAD1  110     1       .165    1       .44526  1       .165    1.5197-4
2799-        PQUAD1  111     112     .290    1       1.0568  1       .290    1.5197-4
2800-        PQUAD1  406     1       .080    1       .06200  1       .080    7.9291-5
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S O R T E D   B U L K   D A T A   E C H O

CARD COUNT	. 1 ..	2 ..	3 ..	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 .
2801-	PQUAD1	610	1	.080	1	.06200	1	.080	5.9837-5	
2802-	PQUAD1	612	1	.080	1	.06200	1	.080	1.0274-4	
2803-	PQUAD2	37	1	.125	0.0					
2804-	PROD	50	50	.116						
2805-	PTRIA1	112	1	.165	1	.44526	1	.165	1.5197-4	
2806-	PTRIA1	113	112	.290	1	1.0568	1	.290	1.5197-4	
2807-	PTRIA1	305	1	.174	1	.12429	1	.174	7.9291-5	
2808-	PTRIA1	407	1	.080	1	.06200	1	.080	7.9291-5	
2809-	PTRIA1	611	1	.080	1	.06200	1	.080	5.9837-5	
2810-	SEQGP	4	313	7	306	8	243	9	162	
2811-	SEQGP	15	141	13	78	17	116	18	143	
2812-	SEQGP	19	189	20	301	21	195	28	232	
2813-	SEQGP	22	133	23	209	24	132	26	255	
2814-	SEQGP	27	182	29	340	25	218	309343	155	
2815-	SEQGP	30	231	6	288	14	20	16	84	
2816-	SEQGP	31	1	32	3	33	256	34	383	
2817-	SEQGP	51	2	52	4	57	257	58	384	
2818-	SEQGP	61	49	62	10	63	263	64	316	
2819-	SEQGP	10101	61	10801	99	90801	96	90101	63	52 31
2820-	SEQGP	10164	56	200122	82	200143	83	200164	85	
2821-	SEQGP	10177	24	740113	178	780122	135	780134	180	
2822-	SEQGP	10864	55	10843	98	10677	23	13343	97	
2823-	SEQGP	12101	93	92101	95	12901	100	92901	94	
2824-	SEQGP	13301	62	14701	40	16001	39	314401	165	
2825-	SEQGP	13321	54	13364	53	13377	22	14721	51	
2826-	SEQGP	14287	15	14787	14	15287	13	17087	11	
2827-	SEQGP	14743	52	14764	50	14277	21	14777	19	
2828-	SEQGP	16021	31	16043	30	16364	29	15277	18	
2829-	SEQGP	16501	38	17001	37	97001	79	96501	80	
2830-	SEQGP	18601	36	98601	77	19301	28	99301	75	
2831-	SEQGP	18643	7	18621	9	18664	6	16077	5	
2832-	SEQGP	18677	8	1	368	2	362	3	320	
2833-	SEQGP	18687	25	90121	41	10121	60	10131	57	
2834-	SEQGP	90131	42	90143	43	10143	58	90164	44	
2835-	SEQGP	94701	81	204701	124	206501	122	207001	121	
2836-	SEQGP	99321	69	19331	33	19343	34	99343	67	
2837-	SEQGP	99331	68	19364	35	99364	66	169331	109	
2838-	SEQGP	169321	110	169343	108	169364	107	239331	113	
2839-	SEQGP	200187	86	310187	127	312487	128	314787	130	
2840-	SEQGP	200801	101	200101	64	202101	115	202901	123	
2841-	SEQGP	204787	89	94787	47	207087	88	97087	45	
2842-	SEQGP	208601	120	209301	76	310801	102	310101	92	
2843-	SEQGP	209387	70	239354	114	239364	74	239375	112	
2844-	SEQGP	239301	117	319301	118	349301	161	644401	271	
2845-	SEQGP	239321	72	239343	73	239307	111	319307	119	
2846-	SEQGP	239387	87	349387	131	349322	157	349333	156	
2847-	SEQGP	249375	71	319387	105	319375	106	349375	151	
2848-	SEQGP	310122	91	310143	125	310164	126	420122	103	
2849-	SEQGP	312101	142	312901	159	317001	163	316501	164	
2850-	SEQGP	317087	129	420187	170	422487	171	424787	172	

S O R T E D   B U L K   D A T A   E C H O

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CARD
COUNT        .   1  ..   2  ..   3  ..   4  ..   5  ..   6  ..   7  ..   8  ..   9  ..  10  .
2901-        SEQGP   1176121 359     1173152 339     1174752 365     1178621 358
2902-        SEQGP   1176143 366     1176152 377     1179331 361     19321   32
2903-        SEQGP   1178601 249     1179301 328     424101  203     534101  230
2904-        SEQGP   1179321 333     1178643 374     1178664 381     1179364 378
2905-        SEQGP   1179343 375     1178687 379     1179387 382     1170131 267
2906-        SPC1    1       5       169321  169331  169343  169364  690122  1010121 +SP31
2907-        +SP31    1010131 1010143 1010164 1010175  740113
2908-        SPC1    1       6       14      20      22      24      27      29      +SP21
2909-        +SP21          30
2910-        SPC1    1       6       61      62      63      64
2911-        SPC1    1       456     1       4       6       7       8       9       +SP11
2912-        +SP11          13      15      16      17      18      19      21      23+SP12
2913-        +SP12          26      28      2       3
2914-        SPC1    1       12456   31      32      33      34
2915-        SPC1    1       23456   51      52      57      58
2916-        SPC1    2       23      63      64
2917-        SPC1    2       123     61      62
2918-        SPC1    10      123     10801   90801   200801  310801  420801  530801  +   SPCS
2919-        +   SPCS  640801  750801  860801  970801 1080801 1170801   18601   98601+   FOR
2920-        +   FOR   208601  318601  428601  538601  648601  758601  868601  978601+   SKIDS
2921-        +   SKIDS 1088601 1178601
2922-        SPC1    11      23      10801   90801   200801  310801  420801  530801  +   SUPP
2923-        +   SUPP  640801  750801  860801  970801 1080801 1170801   18601   98601+   RALE
2924-        +   RALE  208601  318601  428601  538601  648601  758601  868601  978601+   HMP
2925-        +   HMP   1088601 1178601
2926-        SPC1    12      1       10101   10801   12901   13301   14701   16001   + AC END
2927-        + AC END16501   18601   19301
2928-        SPC1    12      2       10101
2929-        SPC1    13      1       1170101 1170801 1172801 1173301 1174701 1176101 + OTHER
2930-        + OTHER 1176501 1178601 1179301
2931-        SPC1    13      2       1170101
2932-        SPC1    14      3       10187   19387   1179387 1170187                     LIFT
2933-        SPC1    15      123456  51      52      57      58                        TI DWN
2934-        SPC1    16      123456  31      32      33      34                          LIFT
2935-        SPCADD  21      2       1
2936-        SPCADD  110     1       10
2937-        SPCADD  116     1       16
2938-        SPCADD  1215    12      15
2939-        SPCADD  1315    13      15
2940-        SPCADD  11112   1       11      12
2941-        SPCADD  11113   1       11      13
2942-        SPCADD  11215   1       12      15
2943-        SPCADD  11315   1       13      15
             ENDDATA
```

RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD SUBCASE 1

D I S P L A C E M E N T   V E C T O R

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312101	G	-3.431700E-02	-9.687600E-02	1.221971E+00	-1.248282E-02	-6.488247E-04	-2.236601E-03
312487	G	-1.534341E-01	1.210732E+00	1.325923E+00	-9.304279E-03	-2.938899E-03	-1.529654E-03
312901	G	-3.276518E-02	-9.407229E-02	1.111686E+00	-1.591780E-02	-2.478344E-05	-8.639190E-04
314401	G	-2.773353E-02	-9.054270E-02	8.275973E-01	-2.066284E-02	2.038006E-03	2.126366E-04
314787	G	-1.169353E-01	1.210425E+00	1.022698E+00	-1.708334E-02	-4.111361E-03	-1.584143E-03
316501	G	-2.046355E-02	-8.891084E-02	3.988742E-01	-1.877502E-02	5.389406E-03	-1.489224E-03
317001	G	-1.452575E-02	-8.895806E-02	3.043134E-01	-1.686084E-02	5.459534E-03	-7.491630E-04
317087	G	-7.823700E-02	1.210691E+00	5.300346E-01	-2.443430E-02	-8.227764E-04	-1.879744E-03
318601	G	-5.435300E-03	-8.918445E-02	8.780690E-02	-1.326720E-02	2.591323E-03	-1.329729E-03
319301	G	-1.345437E-03	-8.896944E-02	-1.262641E-02	-1.403723E-02	3.040978E-03	-1.329268E-03
319307	G	7.284590E-03	-6.142890E-03	-1.334557E-02	-1.346598E-02	4.331475E-03	-2.048534E-03
319375	G	-5.296089E-02	9.636831E-01	-2.040252E-02	-1.788023E-02	3.488055E-03	-2.939171E-03
319387	G	-3.551945E-02	1.210815E+00	-2.029788E-02	-2.212742E-02	2.570391E-03	-1.357659E-03
349301	G	-1.517047E-03	-9.617621E-02	-2.688823E-02	-1.447973E-02	2.240331E-03	-1.706859E-03
349307	G	1.216694E-03	-1.859515E-02	-3.220844E-02	-1.139945E-02	1.979236E-03	-2.385856E-03
349322	G	-1.100588E-02	1.594376E-01	-4.295155E-02	-1.256550E-02	-1.371308E-03	-2.089201E-03
349333	G	-1.736706E-02	3.095632E-01	-4.637663E-02	-1.507463E-02	-1.133575E-03	-4.376938E-03
349343	G	-2.470772E-02	4.696120E-01	-4.744358E-02	-1.512452E-02	-6.428667E-04	-6.108326E-03
349354	G	-3.251995E-02	6.264921E-01	-4.691034E-02	-1.483167E-02	-1.073461E-03	-5.537412E-03
349364	G	-3.876104E-02	7.872604E-01	-4.431341E-02	-1.572736E-02	-1.139576E-03	-4.548563E-03
349375	G	-4.831455E-02	9.535015E-01	-3.780351E-02	-1.735052E-02	2.652854E-03	-2.545606E-03
349387	G	-3.574923E-02	1.204496E+00	-3.286099E-02	-2.283085E-02	2.136934E-03	-1.471825E-03
420101	G	-6.694687E-02	-1.311701E-01	1.535939E+00	-1.475584E-02	-8.371609E-04	-1.288157E-03
420122	G	-9.842921E-02	2.058367E-01	1.542012E+00	-1.616832E-02	-1.531745E-03	-1.982229E-03
420143	G	-1.287836E-01	5.509274E-01	1.545984E+00	-1.631350E-02	-1.656137E-03	-2.719831E-03
420164	G	-1.557885E-01	8.996386E-01	1.548228E+00	-1.555345E-02	-1.066392E-03	-2.491359E-03
420187	G	-1.796051E-01	1.180234E+00	1.548385E+00	-8.794426E-03	-1.098890E-03	-1.437206E-03
420801	G	-5.708652E-02	-1.308161E-01	1.431689E+00	-1.371582E-02	-9.575090E-04	-1.373322E-03
422101	G	-4.789947E-02	-1.284430E-01	1.249539E+00	-1.376305E-02	-1.573581E-03	-4.999621E-04
422487	G	-1.475594E-01	1.178682E+00	1.384452E+00	-7.546062E-03	-2.321247E-03	-1.409949E-03
422901	G	-4.673520E-02	-1.257939E-01	1.125750E+00	-1.869120E-02	-2.007539E-03	-8.385317E-04
424101	G	-4.145813E-02	-1.236257E-01	8.571598E-01	-2.456196E-02	3.434127E-04	-8.051649E-04
424787	G	-1.135733E-01	1.176110E+00	1.101929E+00	-1.739415E-02	-3.202316E-03	-1.453811E-03
426501	G	-3.203689E-02	-1.242113E-01	2.983321E-01	-1.876074E-02	2.686528E-03	1.298891E-03
427001	G	-2.631405E-02	-1.240732E-01	2.183389E-01	-1.436934E-02	2.757184E-03	-1.402210E-03
427087	G	-7.673939E-02	1.178124E+00	5.710963E-01	-2.691578E-02	-2.203031E-03	-1.670493E-03
428601	G	-6.724440E-03	-1.249171E-01	3.920771E-02	-1.025396E-02	2.605431E-03	-1.845575E-03
429301	G	-2.770144E-03	-1.234389E-01	-4.325759E-02	-1.108749E-02	1.298423E-03	-9.461613E-04
429322	G	-8.761490E-03	1.018849E-01	-4.438953E-02	-1.063185E-02	-1.022575E-03	-3.938017E-03
429343	G	-2.448243E-02	3.624037E-01	-4.627259E-02	-1.432061E-02	-1.470704E-04	-6.541363E-03
429364	G	-3.832279E-02	7.009693E-01	-4.721249E-02	-1.784876E-02	-4.470463E-04	-5.395982E-03
429375	G	-4.004970E-02	8.963331E-01	-4.677403E-02	-2.014254E-02	3.019057E-05	-3.726228E-03
429387	G	-3.645544E-02	1.178465E+00	-5.007415E-02	-2.463938E-02	8.209671E-04	-1.811909E-03
530101	G	-7.681038E-02	-1.539298E-01	1.567079E+00	-1.340361E-02	-8.072585E-04	-1.111960E-03
530122	G	-1.037228E-01	1.651060E-01	1.567035E+00	-1.560142E-02	-1.438200E-03	-1.378364E-03
530143	G	-1.317665E-01	5.036317E-01	1.567298E+00	-1.658968E-02	-1.093667E-03	-1.754271E-03
530164	G	-1.546986E-01	8.543050E-01	1.565552E+00	-1.606188E-02	-8.847290E-04	-1.812085E-03
530187	G	-1.706271E-01	1.149859E+00	1.569465E+00	-8.705242E-03	-7.695942E-04	-1.306502E-03
530801	G	-6.838589E-02	-1.530486E-01	1.473923E+00	-1.356159E-02	-7.313547E-04	-8.910353E-04
532101	G	-5.820433E-02	-1.500081E-01	1.282583E+00	-1.673105E-02	-1.354891E-03	-2.685693E-04

RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD　　　　SUBCASE 1

LOAD VECTOR

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
319387	G	-3.108672E+02	0.0	2.072448E+02	-1.095092E+02	1.485356E+02	-1.642638E+02
349301	G	-2.609621E+02	0.0	1.739747E+02	0.0	1.806386E+00	0.0
349307	G	-2.165979E+02	0.0	1.443986E+02	1.603347E+00	-4.221281E+00	2.405021E+00
349322	G	-1.381471E+02	0.0	9.209807E+01	0.0	-2.278011E+01	0.0
349333	G	-1.953770E+02	0.0	1.302513E+02	0.0	-1.800714E+01	0.0
349343	G	-1.339347E+02	0.0	8.928977E+01	0.0	-1.822409E+01	0.0
349354	G	-2.000849E+02	0.0	1.333899E+02	0.0	-1.844104E+01	0.0
349364	G	-1.092020E+02	0.0	7.280133E+01	0.0	-1.600714E+01	0.0
349375	G	-2.274402E+02	0.0	1.516266E+02	3.275644E+00	-5.301280E+01	4.913467E+00
349387	G	-3.576339E+02	0.0	2.384226E+02	-1.189730E+02	1.504202E+02	-1.784595E+02
420101	G	-7.069816E+02	0.0	4.713211E+02	0.0	2.976584E+01	0.0
420122	G	-5.950432E+02	0.0	3.966954E+02	0.0	0.0	0.0
420143	G	-6.499159E+02	0.0	4.332773E+02	6.085335E+01	-5.434128E+02	9.128002E+01
420164	G	-6.092075E+02	0.0	4.061384E+02	0.0	0.0	0.0
420187	G	-8.451272E+02	0.0	5.634181E+02	2.379459E+02	3.227440E+02	3.569189E+02
420801	G	-1.119792E+03	0.0	7.465279E+02	-2.9208[illegible]E+02	2.924425E+02	-4.381338E+02
422101	G	-7.406521E+02	0.0	4.937681E+02	-2.423109E+02	-5.479757E+01	-3.634663E+02
422487	G	-5.288478E+02	0.0	[illegible].525652E+02	0.0	0.0	0.0
422901	G	-9.007096E+02	0.0	6.004731E+02	-9.367349E+01	-3.573699E+02	-1.405102E+02
424101	G	-1.063673E+03	0.0	7.091152E+02	0.0	9.200627E+01	0.0
424787	G	-6.496046E+02	0.0	4.330698E+02	0.0	4.787348E+02	0.0
426501	G	-2.243729E+03	0.0	1.495520E+03	1.885377E+02	5.452513E+01	2.828066E+02
427001	G	-7.059377E+02	0.0	4.706251E+02	2.861980E+02	-2.360498E+02	4.292969E+02
427087	G	-5.541974E+02	0.0	3.694649E+02	0.0	0.0	0.0
428601	G	-1.234273E+03	0.0	8.228485E+02	-5.633426E+01	1.797938E+02	-8.450140E+01
429301	G	-6.209040E+02	0.0	4.139360E+02	0.0	2.872638E+01	0.0
429322	G	-6.079345E+02	0.0	4.052897E+02	0.0	0.0	0.0
429343	G	-6.020002E+02	0.0	4.013335E+02	0.0	0.0	0.0
429364	G	-4.325112E+02	0.0	2.883408E+02	0.0	0.0	0.0
429375	G	-3.058463E+02	0.0	2.038975E+02	0.0	0.0	0.0
429387	G	-6.204227E+02	0.0	4.136151E+02	-2.291848E+02	4.815922E+02	-3.439271E+02
530101	G	-7.069816E+02	0.0	4.713211E+02	0.0	2.976584E+01	0.0
530122	G	-5.506605E+02	0.0	3.671070E+02	0.0	0.0	0.0
530143	G	-7.588615E+02	0.0	5.059077E+02	1.217067E+02	-1.086826E+03	1.825600E+02
530164	G	-6.063121E+02	0.0	4.042081E+02	0.0	0.0	0.0
530187	G	-8.501361E+02	0.0	5.667574E+02	2.379459E+02	3.227440E+02	3.569189E+02
530801	G	-1.048690E+03	0.0	6.991268E+02	-2.254289E+02	2.803552E+02	-3.381434E+02
532101	G	-6.695503E+02	0.0	4.463669E+02	-2.126804E+02	-6.683488E+01	-3.190206E+02
532487	G	-5.928455E+02	0.0	3.952303E+02	0.0	0.0	0.0
532901	G	-8.296079E+02	0.0	5.530719E+02	-9.367349E+01	-3.694572E+02	-1.405102E+02
534101	G	-1.063673E+03	0.0	7.091152E+02	0.0	9.200627E+01	0.0
534787	G	-7.193599E+02	0.0	4.795733E+02	0.0	2.393674E+02	0.0
536501	G	-1.944773E+03	0.0	1.296516E+03	3.770755E+02	-2.350105E+02	5.656132E+02
537001	G	-7.770395E+02	0.0	5.180263E+02	5.646799E+02	-2.239625E+02	8.470199E+02
537087	G	-5.950122E+02	0.0	3.966748E+02	0.0	0.0	0.0
538601	G	-1.226226E+03	0.0	8.174839E+02	-2.328208E+01	4.335100E+01	-3.492312E+01
539301	G	-7.121015E+02	0.0	4.747343E+02	0.0	3.018834E+01	0.0
539322	G	-5.945148E+02	0.0	3.963432E+02	0.0	0.0	0.0
539343	G	-5.832395E+02	0.0	3.888263E+02	0.0	0.0	0.0
539364	G	-6.047270E+02	0.0	4.031513E+02	0.0	0.0	0.0

RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD SUBCASE 1

F O R C E S   O F   S I N G L E - P O I N T   C O N S T R A I N T

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	0.0	0.0	0.0	1.519447E-22	4.447979E-23	4.030169E-23
2	G	0.0	0.0	0.0	3.683708E-23	-3.515788E-24	8.058557E-25
3	G	0.0	0.0	0.0	2.888234E-23	1.361726E-24	-9.815156E-24
6	G	0.0	0.0	0.0	5.543753E-23	-5.135622E-23	8.032999E-24
8	G	0.0	0.0	0.0	2.788436E-23	-1.413944E-23	6.988594E-24
9	G	0.0	0.0	0.0	2.642347E-23	-4.280845E-24	-1.026526E-24
13	G	0.0	0.0	0.0	1.201217E-22	1.473857E-23	2.165398E-23
14	G	0.0	0.0	0.0	0.0	0.0	-9.328127E-06
15	G	0.0	0.0	0.0	8.268149E+05	1.545262E+06	-2.634878E+06
16	G	0.0	0.0	0.0	3.169464E-25	3.192287E-24	3.292709E-23
17	G	0.0	0.0	0.0	6.055888E-23	-5.855013E-24	9.283368E-24
19	G	0.0	0.0	0.0	1.011156E-22	3.603296E-24	9.180990E-24
20	G	0.0	0.0	0.0	0.0	0.0	-7.520430E-08
21	G	0.0	0.0	0.0	6.999199E-25	-1.432398E-25	-8.121689E-26
22	G	0.0	0.0	0.0	0.0	0.0	-1.378939E-07
23	G	0.0	0.0	0.0	7.503926E-25	-7.743020E-26	-5.286833E-25
24	G	0.0	0.0	0.0	0.0	0.0	-2.801517E-08
26	G	0.0	0.0	0.0	2.658011E-23	-2.176759E-24	4.829779E-24
27	G	0.0	0.0	0.0	0.0	0.0	2.351590E-08
28	G	0.0	0.0	0.0	6.716883E-25	7.263280E-26	1.262247E-26
29	G	0.0	0.0	0.0	0.0	0.0	7.303242E-10
30	G	0.0	0.0	0.0	0.0	0.0	1.216449E-09
31	G	-5.820766E-11	0.0	0.0	0.0	0.0	0.0
32	G	8.185452E-11	-4.456524E-11	0.0	0.0	0.0	0.0
33	G	1.746230E-10	-2.910383E-11	0.0	0.0	0.0	0.0
34	G	0.0	-1.455192E-11	0.0	0.0	0.0	0.0
51	G	-1.923649E+04	0.0	-3.005745E+04	0.0	0.0	0.0
52	G	-1.570120E+02	0.0	-2.453347E+02	0.0	0.0	0.0
57	G	2.084387E+04	0.0	-3.259250E+04	0.0	0.0	0.0
58	G	-2.260986E+03	0.0	3.535330E+03	0.0	0.0	0.0
61	G	0.0	0.0	0.0	0.0	0.0	1.210719E-08
62	G	0.0	0.0	0.0	0.0	0.0	1.117587E-08
63	G	0.0	0.0	0.0	0.0	0.0	1.490116E-07
64	G	0.0	0.0	0.0	0.0	0.0	-2.682209E-07
10101	G	8.042356E+04	3.393314E+04	0.0	0.0	0.0	0.0
10801	G	9.685051E+04	0.0	0.0	0.0	0.0	0.0
12901	G	1.597964E+05	0.0	0.0	0.0	0.0	0.0
13301	G	-6.848198E+04	0.0	0.0	0.0	0.0	0.0
14701	G	1.974032E+04	0.0	0.0	0.0	0.0	0.0
16001	G	-2.899736E+04	0.0	0.0	0.0	0.0	0.0
16501	G	8.190112E+04	0.0	0.0	0.0	0.0	0.0
18601	G	1.311317E+04	0.0	0.0	0.0	0.0	0.0
19301	G	-8.268686E+03	0.0	0.0	0.0	0.0	0.0
169331	G	0.0	0.0	0.0	0.0	5.393123E+03	0.0
169343	G	0.0	0.0	0.0	0.0	-2.847193E+03	0.0
169364	G	0.0	0.0	0.0	0.0	1.108647E+04	0.0
1010131	G	0.0	0.0	0.0	0.0	3.843506E+02	0.0
1010143	G	0.0	0.0	0.0	0.0	7.451113E+03	0.0

F O R C E S   I N   B A R   E L E M E N T S   (C B A R)

ELEMENT	BEND-MOMENT END-A		BEND-MOMENT END-B		- SHEAR -		AXIAL	
ID.	PLANE 1	PLANE 2	PLANE 1	PLANE 2	PLANE 1	PLANE 2	FORCE	TORQUE
660197	-3.827823E+02	-3.456084E+03	4.511228E+02	-1.135149E+02	-8.339051E+01	-3.342569E+02	1.962752E+03	-7.345553E-01
660800	2.189954E+03	-2.582452E+03	-4.096272E+03	-5.652425E+03	2.857380E+02	1.392710E+02	-4.182961E+03	-4.142832E+01
662100	3.030066E+02	6.854416E+02	-3.607934E+02	-1.262401E+03	3.017273E+01	8.853829E+01	-1.843393E+03	-2.068955E+00
662900	-7.211606E+03	-1.455673E+03	1.025873E+03	2.707454E+03	-3.744400E+02	-1.892330E+02	-3.136241E+03	-6.250351E+00
669386	1.335382E+03	3.540976E+02	-6.752168E+02	-3.327497E+02	9.139096E+01	3.122029E+01	-3.199385E+03	-4.425172E-01
690053	1.716431E+02	-2.665282E+02	1.192495E+02	1.133246E+02	3.742395E+00	-2.713234E+01	1.754799E+02	-8.228394E-01
690067	1.192495E+02	2.344693E+02	-2.076292E+03	7.499636E+02	1.540731E+02	-3.617480E+01	2.790116E+02	-1.045336E+00
690081	1.396034E+03	9.146159E+02	-2.944791E+02	1.328437E+03	1.339551E+02	-3.277506E+01	-6.765429E+02	6.164339E-01
690800	-4.113960E+03	-2.707015E+03	3.291833E+03	-3.020474E+03	-3.366270E+02	1.424812E+01	-1.015123E+04	-3.452636E+01
692900	-5.815110E+03	-9.692252E+02	3.147322E+03	1.839224E+03	-4.073833E+02	-1.276568E+02	-4.083899E+02	-5.209043E+00
694787	2.626099E+02	-5.002155E+02	7.382060E+02	-6.402858E+03	-2.161205E+01	2.683019E+02	-1.622739E+03	1.168969E-01
696500	3.353760E+04	7.281476E+03	-1.082184E+04	-3.548334E+03	2.016338E+03	4.922641E+02	1.285927E+04	-1.208835E+01
697000	5.997269E+03	3.890945E+03	-6.940834E+03	1.165744E+02	5.880956E+02	1.715623E+02	9.433274E+03	-1.721861E+01
698600	4.926550E+03	1.894063E+02	-9.377650E+02	-5.702759E+02	2.665604E+02	3.453107E+01	-2.689935E+03	-1.514967E+00
699300	-1.071142E+03	-1.554749E+03	1.225535E+03	-8.605123E+02	-1.043944E+02	-3.155621E+01	-2.570655E+03	-9.670363E-01
699301	-1.121407E+02	2.501340E+02	-5.928837E+01	-2.962521E+02	-2.402380E+00	2.483573E+01	-4.416506E+02	-3.309128E-01
699339	-7.335715E+03	-1.633471E+03	5.697826E+03	3.285635E+02	-6.015246E+02	-8.918339E+01	-1.026219E+03	1.802387E+01
699366	-2.528435E+03	-7.937209E+02	2.335851E+03	-2.347032E+02	-2.238312E+02	-2.291003E+01	6.699319E+02	0.0
699374	-2.528435E+03	-3.860462E+02	2.335851E+03	-7.073749E+02	-2.238312E+02	1.460585E+01	1.356547E+03	0.0
699387	8.930506E+01	-1.607356E+02	-8.337122E+01	7.369912E+01	7.816495E+00	-1.065612E+01	-1.204524E+03	-1.065434E-01
700185	-8.769385E+02	2.139216E+03	1.042358E+03	-5.909256E+03	-1.599414E+02	6.707068E+02	1.631647E+04	-9.270134E+00
709387	6.513782E+01	6.806468E+02	-2.745385E+01	-6.317285E+02	4.208703E+00	5.965342E+01	-4.964946E+02	-4.654809E-02
710001	-1.780761E+02	-6.694237E+02	-1.244797E+03	9.909234E+02	8.839341E+01	-1.383628E+02	-1.957135E+03	-5.365825E+00
710046	-1.045941E+03	1.812777E+02	1.286390E+03	-5.718933E+01	-1.335049E+02	1.365010E+01	-1.245311E+03	4.630766E-01
710075	1.623626E+03	-2.617632E+02	-1.569449E+03	1.772355E+02	1.827749E+02	-2.512872E+01	-1.821359E+03	7.409774E-01
720087	5.167319E+02	4.421646E+02	-1.476309E+03	-4.639736E+02	1.660867E+02	7.551152E+01	4.097636E+03	-2.231940E+00
720100	-1.792273E+03	-3.808772E+03	7.159435E+02	-1.623836E+04	-2.090180E+02	1.035774E+03	-1.682284E+04	-1.568071E+01
720187	-4.210422E+02	-5.054065E+03	4.304848E+02	-3.584569E+03	-7.096059E+01	-1.224589E+02	1.074417E+03	-9.751193E-01
726500	8.632639E+02	2.720445E+03	-3.563376E+02	-1.445331E+03	5.552734E+01	1.693535E+02	5.942758E+03	-8.702915E-01
727000	2.362741E+02	1.441984E+03	-2.572477E+02	-7.315193E+01	2.243281E+01	6.886982E+01	1.380078E+03	-1.239640E+00
728600	5.933190E+02	2.169320E+02	-1.582965E+02	-4.771167E+02	3.416434E+01	3.154767E+01	9.216789E+01	-2.181377E-01
730046	-1.045941E+03	7.641573E+01	1.286390E+03	4.767231E+01	-1.335049E+02	1.645301E+00	-3.627199E+02	4.630766E-01
730075	1.623626E+03	-3.622456E+00	-1.569449E+03	-8.090527E+01	1.[illegible]E+02	4.423745E+00	-2.127301E+03	7.409774E-01
750186	-1.014408E+03	-2.711611E+02	-7.265200E+02	-6.3[illegible]2485E+03	-5.[illegible]455E+01	1.118115E+03	1.927395E+04	-1.026267E+01
750400	-1.485031E+03	-7.108996E+02	3.522790E+03	-3.488511E+03	-7.[illegible]540305E+02	3.968916E+02	1.399690E+03	1.674447E+01
751287	1.315199E+02	1.363566E+03	-1.015706E+02	-1.834997E+02	1.013437E+01	6.726372E+01	-8.493881E+02	3.586429E+00
751400	4.718752E+02	-4.192671E+03	-2.932435E+03	-1.381151E+04	2.527328E+02	7.140938E+02	-2.207747E+03	6.386042E+00
752500	4.085049E+03	-1.267052E+04	-4.735271E+02	-1.286322E+04	5.614010E+02	2.380546E+01	-4.535652E+03	2.898269E+00
753587	-1.015706E+02	-1.197800E+03	6.192424E+01	-1.879518E+03	-6.994432E+00	2.916438E+01	-4.170038E+01	1.048655E+00
753800	-9.450041E+02	-9.299360E+03	-3.333826E+02	8.365135E+03	-3.438973E+01	-9.932243E+02	-6.396947E+02	-8.465757E+00
755600	-3.333928E+02	1.814733E+04	1.892393E+03	2.420142E+04	-1.225980E+02	-3.334669E+02	4.102332E+03	-1.728037E+01
755887	-2.113933E+02	-2.116878E+03	-1.016933E+02	-1.609285E+03	-4.693045E+00	-2.171524E+01	2.342069E+02	-2.947100E+00
756700	-2.765216E+03	2.102100E+04	-4.705993E+03	1.748139E+04	3.696718E+02	6.742106E+02	3.945960E+03	2.560354E+00
757800	4.358872E+03	1.429952E+04	-2.932871E+03	3.896249E+03	4.565900E+02	6.514257E+02	2.374547E+03	7.381904E+00
758187	-1.016933E+02	-1.011917E+03	3.377936E+02	6.224245E+02	-1.895144E+01	-7.047610E+01	2.[illegible]66328E+02	-3.290237E+00
758900	3.386772E+03	8.389056E+03	-2.432998E+03	3.051695E+03	8.094255E+02	7.423311E+02	2.318092E+03	1.593966E+00
759311	1.169466E+03	1.272663E+03	-1.750651E+02	-7.639503E+02	6.153461E+01	9.320884E+01	1.595123E+03	2.242121E+00
759332	-1.750651E+02	-1.218664E+03	-4.237239E+02	-2.501166E+03	1.184090E+01	6.107154E+01	1.543891E+03	2.126136E+00
759353	9.039708E+02	-2.643991E+03	-7.036618E+02	-1.565812E+03	7.655394E+01	-5.134184E+01	1.195067E+03	-5.231770E+00
759375	4.832205E+02	-8.450522E+02	-1.010976E+03	-5.373116E+02	6.533434E+01	-1.345607E+01	7.122229E+02	2.335414E-01

R ' HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD SUBCASE 1

F O R C E S   I N   G E N E R A L   Q U A D R I L A T E R A L   E L E M E N T S   (C Q U A D 1)

ELEMENT ID.	BEND-MOMENT X	BEND-MOMENT Y	TWIST-MOMENT	SHEAR X	SHEAR Y
900004	7.511792E+00	9.448358E+01	8.363576E+01	9.470714E+00	-3.339428E-03
900081	-3.060325E+01	1.267402E+02	-8.571990E+01	1.612326E+01	-5.869985E+01
911400	6.330862E+02	-4.996442E+02	-6.116241E+02	-8.113318E+01	8.766496E+01
912400	8.926099E+02	-4.023924E+02	-5.552952E+02	4.316210E+01	8.135015E+00
913587	-5.673358E+01	-2.166111E+02	1.065058E+00	-3.773568E+00	1.043887E+01
913700	-2.257118E+02	-7.559752E+02	-4.355238E+02	1.448978E+02	-3.688434E+01
915600	-2.841726E+03	-1.799996E+03	-2.273592E+02	2.171004E+02	-1.880305E+02
915887	-1.092877E+02	-2.680272E+02	4.351659E+01	-2.857242E+00	-3.089182E+00
916700	-2.762812E+03	-1.795377E+03	1.005482E+03	-3.978531E+02	-1.925420E+02
917800	-1.099043E+03	-6.262954E+02	1.626798E+02	4.433300E+01	-4.381444E+01
918187	-1.398979E+01	-2.917098E+01	6.726931E+01	1.907079E+00	-2.054289E+01
918900	-9.373641E+02	-5.472495E+02	2.956913E+01	-3.316219E+02	1.418979E+01
919311	6.261796E+01	5.497964E+01	7.628998E+01	-8.529372E+00	-9.032514E+00
919332	2.053944E+02	1.416886E+02	1.024091E+02	-9.385661E+00	9.102887E+00
919353	4.019272E+02	2.777482E+02	-9.870043E-01	-3.202831E+01	3.844676E+01
919375	8.656388E+01	1.356796E+02	-1.155278E+02	1.093423E+00	1.137652E+01
970026	-3.267629E+01	-4.572031E+01	-1.189498E+01	2.264213E+00	1.488482E+01
970937	-1.293245E-02	-3.634422E+01	3.852020E+01	6.409290E+00	-2.533430E+01
1021287	3.431087E+01	7.522646E+01	-6.572155E+01	1.042033E+01	2.393251E+01
1021400	5.153472E+02	8.673439E+00	-2.057932E+02	-6.986042E+01	-9.414675E+01
1022400	1.052979E+03	3.406065E+02	-3.799994E+02	-6.993536E+01	-1.390799E+02
1023587	-7.245391E+01	-1.568560E+02	-6.664681E+01	-2.868301E+00	9.950628E-01
1023700	3.153403E+02	2.157279E+01	-2.576543E+02	1.504759E+02	-8.747457E+01
1025600	-1.752386E+03	-8.925735E+02	-1.046048E+02	1.449341E+02	-5.166404E+01
1025887	-1.170312E+02	-1.909033E+02	5.792119E+01	-2.366574E+00	7.766287E+00
1026700	-5.970606E+02	-6.419720E+02	5.329279E+02	2.874835E+02	4.182089E+01
1027800	-1.906787E+03	-1.148761E+03	8.124905E+02	1.460926E+01	1.540498E+02
1028187	-3.066471E+01	1.449343E+00	6.492626E+01	5.201969E+00	-3.059704E+01
1028900	-1.150599E+03	-7.835583E+02	-4.588752E+01	-4.844518E+02	2.466329E+02
1029311	1.947158E+02	7.204696E+01	1.331225E+02	1.793399E+01	-1.178987E+00
1029353	3.280171E+01	-3.267305E+01	-1.151957E+01	-6.461510E-02	1.492827E+01
1029375	1.017145E+02	3.706850E+00	-1.722401E+02	-1.045306E+01	2.939297E+00
1040011	2.333033E+01	6.315194E+01	-4.632660E+00	2.653020E+00	6.268049E+00
1040026	-1.267102E+01	-2.146325E+01	-1.029916E+01	8.232379E+00	5.211856E+00
1040037	5.897364E+01	4.467185E+01	1.159590E+01	2.269498E+01	-2.387236E+01
1040053	4.013225E+01	-4.123717E+01	2.035244E+01	4.970424E+00	1.284753E+00
1101287	-6.295175E+01	-3.940179E+00	-7.253630E+01	2.317580E+01	2.274009E+01
1103587	-9.921465E+01	-1.128459E+02	-6.263453E+01	5.251161E-01	-6.140690E+00
1105887	-1.792587E+02	-1.127366E+02	-3.846643E-01	1.834067E+01	3.435865E+00
1108187	-1.339056E+02	-1.255183E+01	1.705195E+02	5.396935E+01	-2.568069E+01
1120011	-1.658734E+01	1.679034E+01	-1.149001E+01	3.968146E+00	6.294901E+00
1120037	-1.200396E+02	-3.253950E+01	-2.289224E+01	1.061546E+01	1.746444E+01
1120053	-1.909334E+02	-2.748093E+01	-3.214435E+01	3.698696E+00	-7.108563E+00
1120400	1.072722E+02	-1.224742E+02	8.525730E+01	-2.521995E+01	5.378984E+01
1121400	1.324210E+02	-7.164911E+01	6.120795E+01	-2.540003E+01	6.755495E+01
1122400	4.607313E+02	6.764237E+01	-1.625231E+02	-6.116490E+01	6.705635E+01
1126700	4.975863E+02	-1.757503E+02	-1.052217E+02	4.215831E+02	-3.154060E+02
1127800	-1.456870E+03	-6.311517E+02	3.877474E+02	6.417036E+01	-2.824352E+02
1128900	-4.838058E+02	-1.025417E+02	1.344765E+03	-2.603683E+02	-1.114402E+02
1129311	1.012368E+02	-7.251788E+01	7.507553E+01	3.438812E+01	2.225560E+01

RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD SUBCASE 1

S T R E S S E S   I N   B A R   E L E M E N T S   (C B A R)

ELEMENT ID.	SA1 / SB1	SA2 / SB2	SA3 / SB3	SA4 / SB4	AXIAL STRESS	SA-MAX / SB-MAX	SA-MIN / SB-MIN	M.S.-T / M.S.-C
200053	1.851646E+03	-9.846262E+02	-1.220014E+03	1.347244E+03	-7.323054E+02	1.119341E+03	-1.952320E+03	
	1.392094E+03	-6.345367E+02	-8.968710E+02	8.299499E+02		6.597882E+02	-1.629176E+03	
200075	1.686844E+03	-8.376754E+02	-1.100010E+03	1.124599E+03	-6.303468E+02	1.056495E+03	-1.730358E+03	
	2.356794E+02	-1.008514E+03	-3.253141E+02	1.699679E+03		1.069330E+03	-1.638862E+03	
200400	-2.734315E+03	-3.205906E+03	-3.205906E+03	5.002888E+03	1.618000E+03	6.620886E+03	-1.587906E+03	
	5.309121E+03	4.493539E+03	4.493539E+03	-7.365927E+03		6.927121E+03	-5.767627E+03	
201287	4.891426E+02	-8.761095E+02	-6.777066E+02	5.575028E+02	-5.219590E+02	3.554380E+01	-1.398069E+03	
	-1.090374E+03	1.531004E+03	1.591950E+03	-1.613238E+03		1.069991E+03	-1.612333E+03	
201400	-9.225924E+03	-2.999565E+03	-2.999565E+03	6.366813E+03	-2.633155E+02	6.103497E+03	-9.489239E+03	
	3.916987E+03	4.477603E+03	4.477603E+03	-7.012190E+03		4.214288E+03	-7.275505E+03	
202500	-1.116373E+04	-1.294127E+03	-1.294127E+03	4.563214E+03	-1.150515E+03	3.412698E+03	-1.231425E+04	
	9.038047E+02	5.448131E+03	5.448131E+03	-7.555524E+03		4.297616E+03	-8.706039E+03	
203587	-1.539025E+03	2.181986E+03	2.242934E+03	-1.441586E+03	4.382811E+01	2.286762E+03	-1.495197E+03	
	-1.241665E+03	2.042276E+03	1.755649E+03	-1.316405E+03		2.086104E+03	-1.272577E+03	
203800	-6.390721E+03	7.925739E+02	7.925739E+02	5.500127E+02	-1.752862E+02	6.172877E+02	-6.566006E+03	
	-6.927028E+02	-9.373577E+01	-9.373577E+01	3.012142E+02		1.259280E+02	-8.679890E+02	
205600	-5.525714E+02	6.457034E+02	6.457034E+02	-7.265634E+02	4.728457E+02	1.118549E+03	-2.558177E+02	
	6.627668E+03	-1.445226E+03	-1.445226E+03	2.678326E+02		7.100513E+03	-9.723802E+02	
205887	-1.147590E+03	1.654630E+03	1.667152E+03	-1.689951E+03	2.365771E+02	1.903729E+03	-9.110129E+02	
	-9.134263E+02	1.363262E+03	1.318068E+03	-6.927086E+02		1.599839E+03	-6.768492E+02	
206700	-7.837400E+02	-3.223298E+03	-3.223298E+03	4.533367E+03	4.061341E+02	4.939201E+03	-2.817164E+03	
	6.928804E+03	1.363886E+03	1.363886E+03	-3.613111E+03		7.334939E+03	-3.206977E+03	
207800	-4.003735E+03	-2.214702E+03	-2.214702E+03	3.990630E+03	-9.270327E+02	3.063798E+03	-4.930768E+03	
	1.728636E+03	3.067266E+03	3.067266E+03	-4.562146E+03		2.140233E+03	-5.489178E+03	
208187	-1.321494E+02	2.296448E+02	1.644500E+02	-1.467835E+02	4.973274E+00	2.346181E+02	-1.418102E+02	
	2.054771E+03	-2.820381E+03	-3.012438E+03	1.874195E+03		2.059744E+03	-3.007464E+03	
208900	-6.836720E+03	2.768234E+03	2.768234E+03	-1.994206E+03	-8.270380E+02	1.511196E+03	-7.663758E+03	
	5.749296E+03	1.829200E+03	1.829200E+03	-3.913755E+03		4.922258E+03	-4.740793E+03	
209386	0.0	0.0	0.0	0.0	3.670341E+03	3.670341E+03	3.670341E+03	
	0.0	0.0	0.0	0.0		3.670341E+03	3.670341E+03	
219100	0.0	0.0	0.0	0.0	-6.127751E+02	-6.127751E+02	-6.127751E+02	
	0.0	0.0	0.0	0.0		-6.127751E+02	-6.127751E+02	

RAIL HUMP-A/C END FORWARD-VERTICAL ACCELERATION UPWARD SUBCASE 1

S T R E S S E S   I N   G E N E R A L   Q U A D R I L A T E R A L   E L E M E N T S   (C Q U A D 1)

ELEMENT ID.	FIBRE DISTANCE	STRESSES IN ELEMENT COORD SYSTEM NORMAL-X	NORMAL-Y	SHEAR-XY	PRINCIPAL STRESSES (ZERO SHEAR) ANGLE	MAJOR	MINOR	MAX SHEAR
57800	0.0	-1.094442E+03	-2.614827E+03	-2.205414E+03	-35.4906	4.781202E+02	-4.187389E+03	2.332755E+03
	0.0	-1.094442E+03	-2.614827E+03	-2.205414E+03	-35.4906	4.781202E+02	-4.187389E+03	2.332755E+03
58900	0.0	-1.045620E+02	-1.500495E+02	-1.938751E+03	-44.6639	1.811578E+03	-2.066190E+03	1.938884E+03
	0.0	-1.045620E+02	-1.500495E+02	-1.938751E+03	-44.6639	1.811578E+03	-2.066190E+03	1.938884E+03
119326	0.0	1.291189E+02	1.280235E+03	-2.543843E+03	-51.3744	3.312821E+03	-1.903464E+03	2.608142E+03
	0.0	1.291189E+02	1.280235E+03	-2.543843E+03	-51.3744	3.312821E+03	-1.903464E+03	2.608142E+03
119337	0.0	-1.939235E+02	1.146375E+03	-2.446879E+03	-52.6583	3.013215E+03	-2.060764E+03	2.536990E+03
	0.0	-1.939235E+02	1.146375E+03	-2.446879E+03	-52.6583	3.013215E+03	-2.060764E+03	2.536990E+03
119353	0.0	5.936181E+02	8.977212E+02	-1.403828E+03	-48.0909	2.157708E+03	-6.663688E+02	1.412038E+03
	0.0	5.936181E+02	8.977212E+02	-1.403828E+03	-48.0909	2.157708E+03	-6.663688E+02	1.412038E+03
140011	0.0	-7.008064E+03	-4.619043E+03	-3.634997E+03	-54.0956	-1.987320E+03	-9.639787E+03	3.826233E+03
	0.0	-7.008064E+03	-4.619043E+03	-3.634997E+03	-54.0956	-1.987320E+03	-9.639787E+03	3.826233E+03
140053	0.0	9.055479E+02	-1.088516E+03	-1.088432E+02	-3.1151	9.114714E+02	-1.094440E+03	1.002955E+03
	0.0	9.055479E+02	-1.088516E+03	-1.088432E+02	-3.1151	9.114714E+02	-1.094440E+03	1.002955E+03
140075	0.0	3.090788E+03	8.002907E+01	4.268195E+02	7.9148	3.150126E+03	2.069061E+01	1.564718E+03
	0.0	3.090788E+03	8.002907E+01	4.268195E+02	7.9148	3.150126E+03	2.069061E+01	1.564718E+03
140400	0.0	-5.325845E+02	-8.225179E+03	-3.128334E+03	-19.5614	5.789883E+02	-9.336752E+03	4.957870E+03
	0.0	-5.325845E+02	-8.225179E+03	-3.128334E+03	-19.5614	5.789883E+02	-9.336752E+03	4.957870E+03
141287	0.0	3.494642E+03	7.239581E+02	8.651999E+02	15.9932	3.742623E+03	4.759773E+02	1.633323E+03
	0.0	3.494642E+03	7.239581E+02	8.651999E+02	15.9932	3.742623E+03	4.759773E+02	1.633323E+03
141400	0.0	-2.705322E+03	-6.465727E+03	-3.719162E+03	-31.5907	-4.181120E+02	-8.752937E+03	4.167413E+03
	0.0	-2.705322E+03	-6.465727E+03	-3.719162E+03	-31.5907	-4.181120E+02	-8.752937E+03	4.167413E+03
142500	0.0	-2.979670E+03	-6.002742E+03	-3.307040E+03	-32.7182	-8.551011E+02	-8.127311E+03	3.636105E+03
	0.0	-2.979670E+03	-6.002742E+03	-3.307040E+03	-32.7182	-8.551011E+02	-8.127311E+03	3.636105E+03
143587	0.0	1.925598E+03	7.717483E+02	4.793102E+02	19.8599	2.098727E+03	5.986194E+02	7.500536E+02
	0.0	1.925598E+03	7.717483E+02	4.793102E+02	19.8599	2.098727E+03	5.986194E+02	7.500536E+02
143800	0.0	-2.337368E+03	-5.768115E+03	-4.746005E+03	-35.0642	9.937488E+02	-9.099232E+03	5.046491E+03
	0.0	-2.337368E+03	-5.768115E+03	-4.746005E+03	-35.0642	9.937488E+02	-9.099232E+03	5.046491E+03
145600	0.0	-2.101727E+03	-4.370267E+03	-4.808896E+03	-38.3641	1.704859E+03	-8.176852E+03	4.940855E+03
	0.0	-2.101727E+03	-4.370267E+03	-4.808896E+03	-38.3641	1.704859E+03	-8.176852E+03	4.940855E+03
145887	0.0	1.302394E+03	6.420560E+02	5.589153E+02	29.7142	1.621376E+03	3.230733E+02	6.491515E+02
	0.0	1.302394E+03	6.420560E+02	5.589153E+02	29.7142	1.621376E+03	3.230733E+02	6.491515E+02

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